



AC SERVO SYSTEM

Introduction

About Us

Larsen & Toubro (L&T) is a technology-driven USD 9.8 billion company that infuses engineering with imagination. The Company offers a wide range of advanced solutions, in the fields of Engineering, Construction, Electrical & Automation, Machinery and Information Technology.

L&T Switchgear, which forms part of the Electrical & Automation business, is India's largest manufacturer of low voltage switchgear, with the scale, sophistication and range to meet global benchmarks. With over four decades of experience in this field, the Company today enjoys a leadership position in the Indian market with growing presence in international markets.

It offers a complete range of products including; controlgear, powergear, motor starters, energy meters, wires and host of other accessories. Most of our products conform to international standards, carry CE markings and are KEMA certified.



Switchgear Factory,
Mumbai

Servo Power

Larsen & Toubro's New Generation Servomotor and Drive incorporates the latest technological advancements in motion control system.

Servomotor and Servopack are used in closed loop control systems in which work is the control variable. The digital Servomotor controller directs operation of the Servomotor by sending velocity command signals to the Servopack, which drives the Servomotor. An integral feedback device provide the Servomotor's position and velocity feedback that the controller compares to its programmed motion profile and uses to alter its velocity signal.

AC Servomotors are used in AC Servo mechanisms which require rapid and accurate response characteristics. To obtain these characteristics, Servomotors have small-diameter high-resistance rotors. The small diameter provides

low inertia for fast starts, stops, and reversals, while the high resistance provides a nearly linear speed-torque relationship for accurate control.

In an ideal Servomotor, torque at any speed is directly proportional to control-winding voltage. In practice, however, this relationship exists only at zero speed because of the inherent inability of an induction motor to respond to voltage input changes under conditions of light load.

L&T introduces Servo system with enhanced performance and functions. - II series, - V series, Junma series and MP series controllers are easy to use and conforms to world standard.



Manufactured by :
YASKAWA Electric Corporation
JAPAN

Range of Servo Products

Sigma-II Series Servo Drives - 30W to 90 kW

- Choice of Low inertia, Middle inertia and High inertia motors
- Very good peak torque performance (approx 300%) for longer period of time to help in quick acceleration
- 17 bit incremental encoder* (resolution-131072 PPR) as standard with Serial Interface to Servopack. Option for absolute encoder
- Choice of Servo Drives with 200V & 400V
- Speed Control, Position Control, Torque Control and Contact Speed as Standard
- On the fly mode change through digital input possible as standard
- Analog / Pulse train reference as standard with network option of Mechatrolink-II, Profibus, Devicenet



JUNMA Series Servo Drives - 100W to 750W

- Excellent cost to performance ratio for Position Control
- Industry's first plug and play type Servo Drive
- Achieve optimum Servo performance without gain setting and tuning parameters (No gain tuning and parameter setting required)
- Great stability despite of load changes
- Encoder resolution : 10000 PPR
- Option for servomotor with electromagnetic brake
- Selectable electronic gear 1000 PPR, 2500 PPR, 5000 PPR and 10000 PPR
- Option of Mechatrolink- II communication



Sigma-V Series Servo Drives - 50W to 15 kW

- Very High Performance Servo with outstanding frequency response of 1600 Hz (best in Industry)
- Choice of Low inertia, Middle inertia and High inertia motors
- Very good peak torque performance (approx 350%) for longer period of time to help in quick acceleration
- 20 bit incremental encoder (resolution-1,048,576 PPR) as standard with Serial Interface to the Servopack
- Max speed upto 6000 rpm
- Option for Servomotor with electromagnetic brake
- Faster setup, simple tuning process with tuneless function



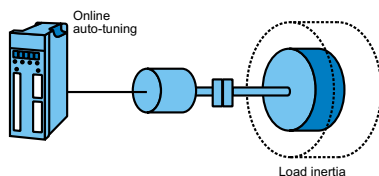
* Except SGMAH & SGMPH series

Servo Drives - 30 W to 90 kW



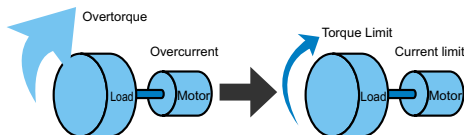
Easy setup and operation/Online auto-tuning

Simple set-up : Just plug-and-play enhanced inertia matching precision eliminates the need for Servo gain adjustment.



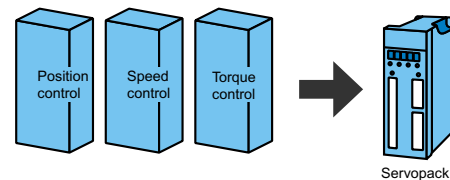
Current (torque) limit

The peak current input to the motor can be limited to minimize occurrence of overtorque and reduce machinery damage.



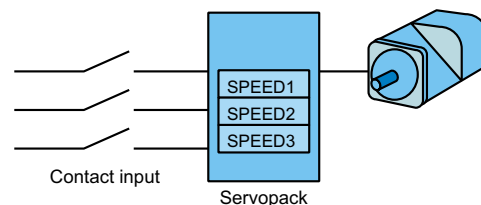
All-in-one control

Position, torque and speed can be controlled independently, with simple switching between control modes.



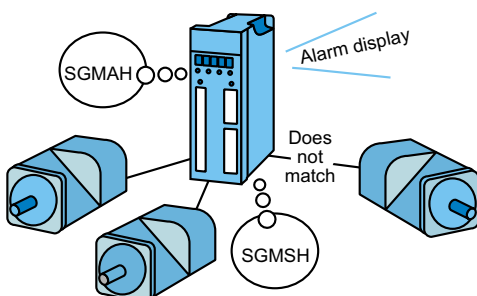
Selection of internal speed presets

The motor can be operated at any of the three preset user speeds.



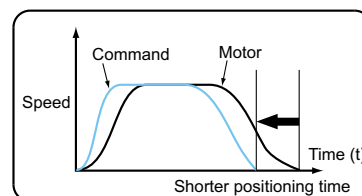
High resolution serial encoder

- Error checking eliminates positioning inaccuracies due to electrical noise
- Reduces number of wires to half
 - Absolute encoder: 15 to 7 wires
 - Incremental encoder: 9 to 5 wires
- Amplifier automatically recognizes the motor and optimizes parameters



Feed forward compensation

Feed forward compensation provides reduced positioning time.



Type Designation

SGMAH - 01 A 1 A 2 S

- II Servomotor Type
SGMAH: Super High Power Rate Type
SGMGH: High-Speed Feed Type

Brake, Oil Seal
Specifications (7th Digit)

1	No Brake, No Oil Seal
S	No Brake, Oil Seal
B	90V Break, No Oil Seal
C	24V Break, No Oil Seal
D	Oil Seal +90VDC Brake
E	Oil Seal +24VDC Brake

Capacity kW (1st & 2nd Digit)

Code	SGMAH	SGMGH
A3	0.03	
A5	0.05	
01	0.1	
02	0.2	
04	0.4	
05		0.45
06		
09		0.85
13		1.3
20		1.8
30		2.9
44		4.4
55		5.5
75		7.5
1A		11
1E		15

Voltage (3rd Digit)

Code	Voltage(V)
A	200
D	400

Design Procedure A
(5th Digit)

Serial Encoder Specifications (4th Digit)

Code	Shaft End	Type	
		SGMAH	SGMGH
1	16-Bit Absolute	●	
2	17-Bit Absolute		●
A	13-Bit Incremental	●	
B	16-Bit Incremental	O	
C	17-Bit Incremental		●

Shaft End Specifications (6th Digit)

Code	Shaft End	Type	
		SGMAH	SGMGH
2	Straight, no key	●	●
3	Taper 1/10, with parallel key		O
4	Straight, key	O	
5	Taper 1/10, with woodruff key		O
6	Straight, key, tapped	O	O
8	Straight, tapped	O	

●-Standard O-Optional

Color Code	Voltage (V)
	200
	200/400



Ratings (30 W to 90 kW)*

Series		Capacity (kW)	Rated Torque (N.m)	Peak Torque (N.m)	Rated Speed (Peak Speed) (rpm)	Inertia (kg. m ² 10 ⁻⁴)	Maximum Allowed Load Moment of Inertia	Rated Power (kW/s)
Small-Capacity	SGMAH Super High Power Rate Series. Faster acceleration with lower inertia	0.03	0.0955	0.286	3000 (5000)	0.0166	30 times	5.49
		0.05	0.159	0.477		0.022		11.5
		0.1	0.318	0.955		0.0364		27.8
		0.2	0.637	1.91		0.106		38.2
		0.4	1.27	3.82		0.173	20 times	93.7
		0.75	2.39	7.16		0.672		84.8
Medium-Capacity	SGMGH High Speed Feed Series. High speed rotation required without load	0.45	2.84	8.92	1500 (3000)	7.24	5 times	11.2
		0.85	5.39	13.8		13.9		20.9
		1.3	8.34	23.3		20.5		33.8
		1.8	11.5	28.7		31.7		41.5
		2.9	18.6	45.1		46		75.3
		4.4	28.4	71.1		67.5		120
		5.5	35	87.6		89		137
		7.5	48	119		125		184
		11	70	175	1500 (2000)	281		174
		15	95.4	224		315		289

- All - II Servomotors are available with an absolute encoder, electromagnetic brake and oil seal as option
- All - II Servomotor use serial encoder
- Refer to - II Servo user manual for detailed specifications and dimensions

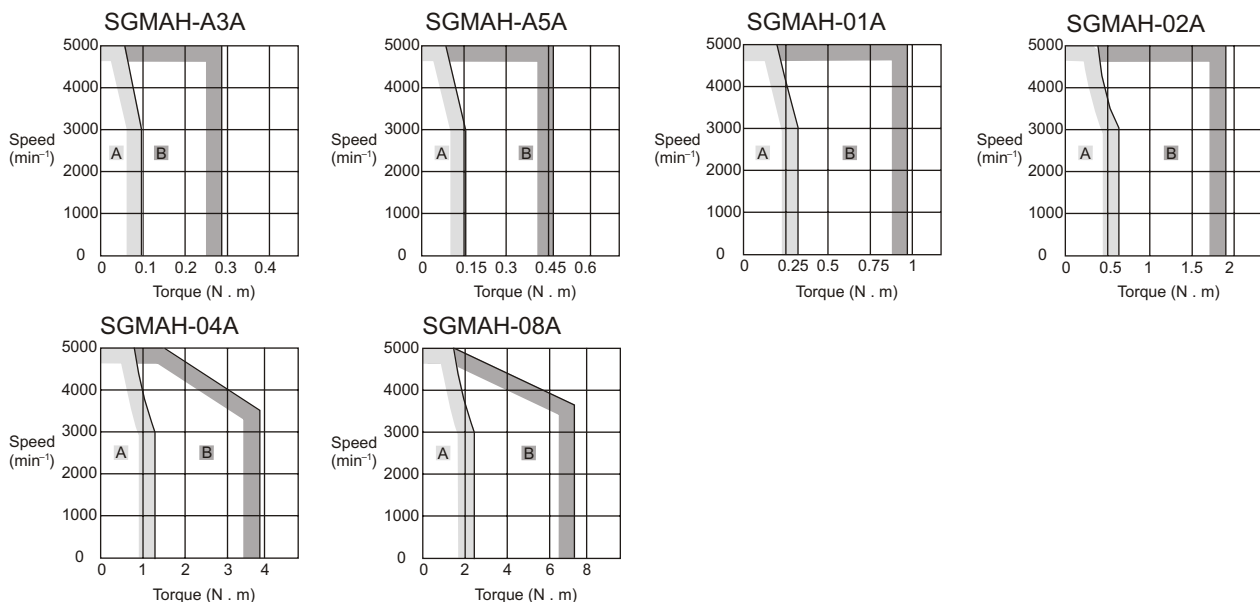
* For ratings beyond 15kW please contact branch office

SGMAH series

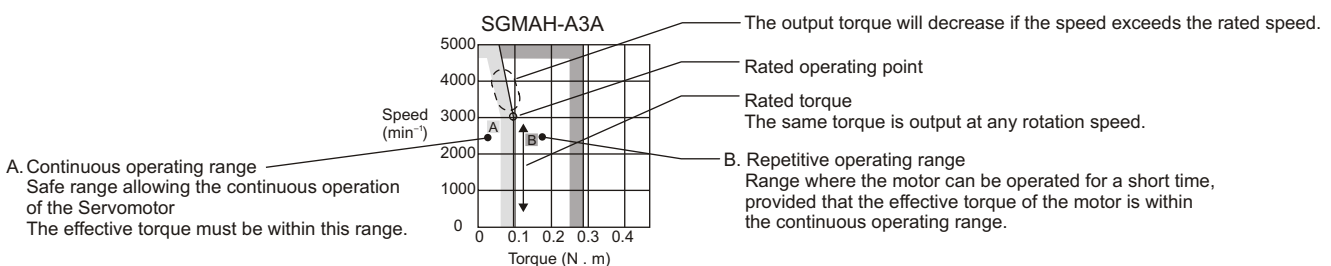
Specifications

Applied Voltage Servomotor Type SGMAH - [] []		230V					
		A3A	A5A	01A	02A	04A	08A
Rated Output	W	30	50	100	200	400	750
Rated Torque	N·m	0.0955	0.159	0.318	0.637	1.27	2.39
Instantaneous Peak Torque	N·m	0.286	0.477	0.955	1.91	3.82	7.16
Rated Rotation Speed	min ⁻¹	3000					
Max. Rotation Speed	min ⁻¹	5000					
Moment of Inertia (JM)	kg·m ² × 10 ⁻⁴	0.0166	0.0220	0.0364	0.106	0.173	0.672
Allowable Load Moment of Inertia (JL)	as much as the Moment of Inertia	30 times or less				20 times or less	
Rated Power Rate	kW/s	5.49	11.5	27.8	38.2	93.7	84.8
Applicable Encoder	Standard	Incremental Encoder (13 bits: 2048P/R)					
	Option	Incremental Encoder (16 bits: 16384P/R), Absolute Encoder (16 bits: 16384P/R)					
Basic Specifications	Time Rating	Continuous					
	Insulation Class	Class B					
	Ambient Temperature	0 to + 40°C					
	Ambient Humidity	20 to 80% (non-condensing)					
	Vibration Class	15μm or below					
	Enclosure	Totally-enclosed, self-cooled, IP55 (excluding shaft opening)					
	Vibration Resistance	Vibration acceleration 49m/s ²					
	Mounting	Flange-mounted					

Torque-Speed characteristics (A : Continuous Duty Zone B : Intermittent Duty Zone)



How to read a graph of speed and torque characteristics



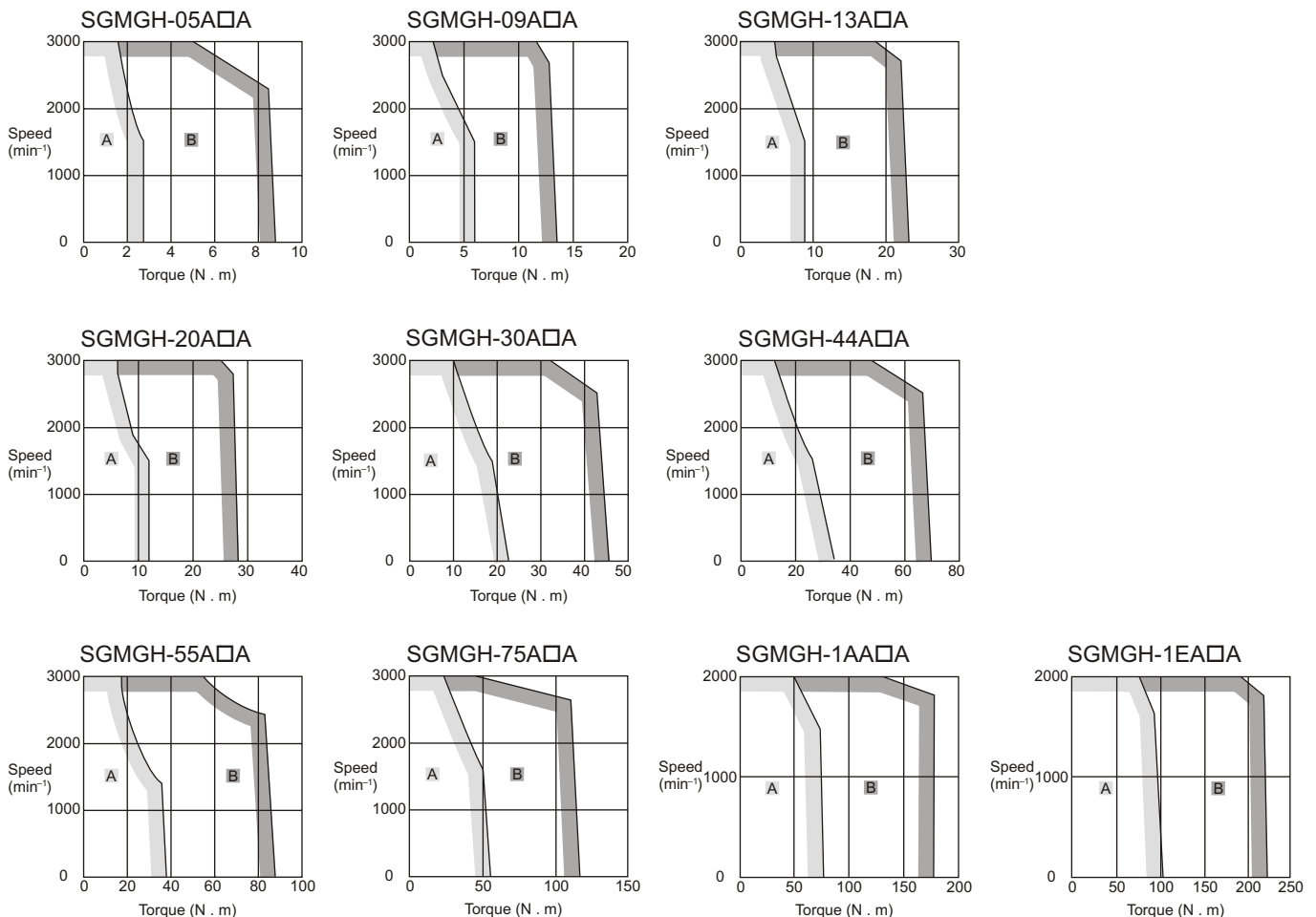
SGMGH series

Specifications

Applied Voltage Servomotor Type SGMGH - □□□		230V									
		05A□□	09A□□	13A□□	20A□□	30A□□	44A□□	55A□□	75A□□	1AA□□	1EA□□
Rated Output	kW	0.45	0.85	1.3	1.8	2.9	4.4	5.5	7.5	11	15
Rated Torque	N·m	2.84	5.39	8.34	11.5	18.6	28.4	35.0	48.0	70.0	95.4
Instantaneous Peak Torque	N·m	8.92	13.8	23.3	28.7	45.1	71.1	87.6	119	175	221
Rated Rotation Speed	min ⁻¹	1500									
Max. Rotation Speed	min ⁻¹	3000									2000
Moment of Inertia (J)	kg·m ² × 10 ⁻⁴	7.24	13.9	20.5	31.7	46.0	67.5	89.0	125	281	315
Allowable Load Moment of Inertia	as much as the Moment of Inertia	5 times or less									
Rated Power Rate	kW/s	11.2	20.9	33.8	41.5	75.3	120	137	184	174	289
Applicable Encoder	Standard	Incremental Encoder (17 bits: 16384P/R*)									
	Option	Absolute Encoder (17 bits/20 bits: 16384P/R*)									
Basic Specifications	Time Rating	Continuous									
	Insulation Class	Class F									
	Ambient Temperature	0 to +40°C									
	Ambient Humidity	20 to 80% (non-condensing)									
	Vibration Class	15μm or below									
	Enclosure	Totally-enclosed, self-cooled, IP67 (excluding shaft opening)									
	Vibration Resistance	Vibration acceleration 24.5m/s ² (2.5G)									
	Mounting	Flange-mounted									

* : For 17-bit and 20-bit encoders (without divider), pulses output from Servopack are also 16384 P/R.

Torque-Speed characteristics (A : Continuous duty zone B : Intermittent duty zone)

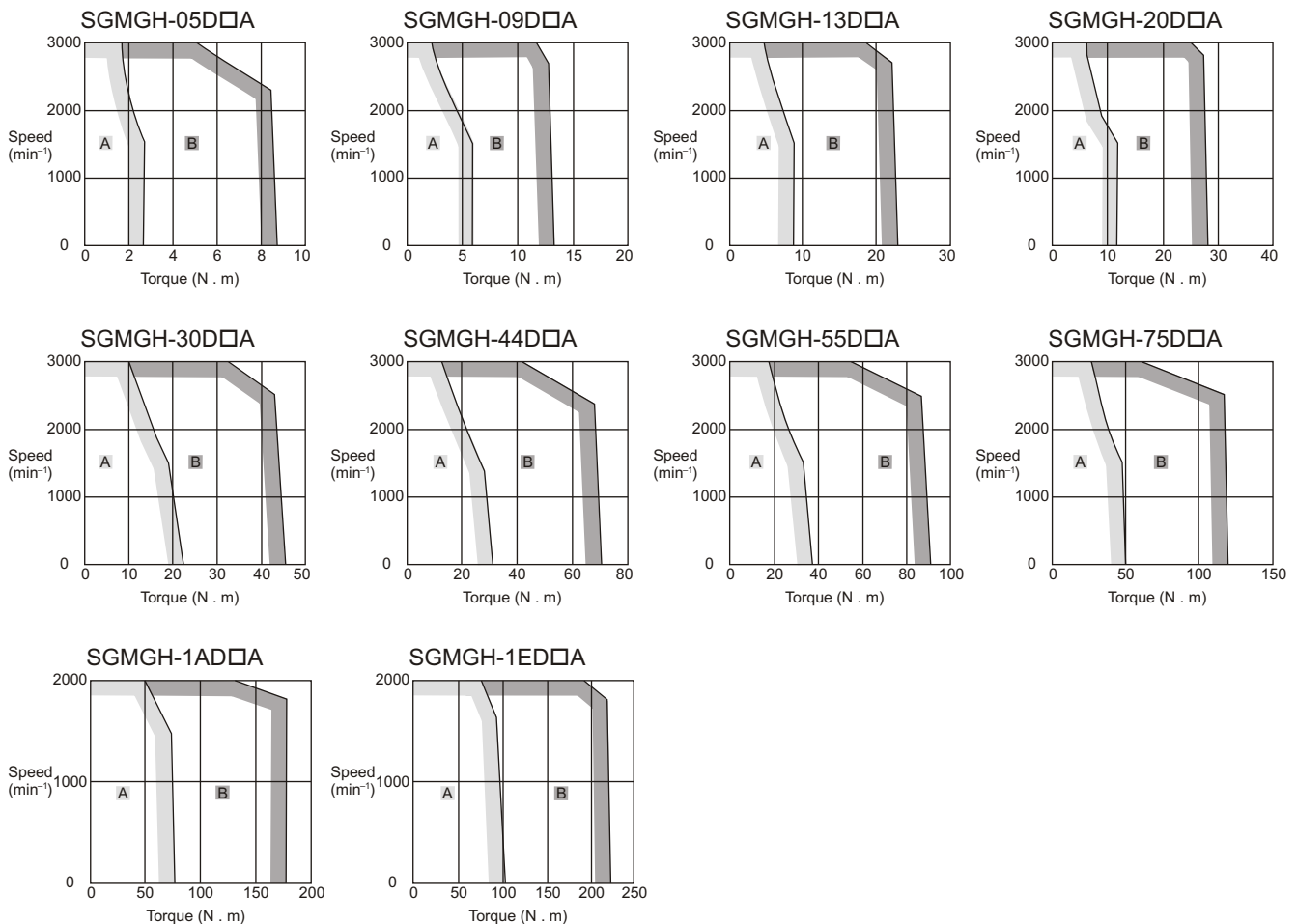


SGMGH series

Specifications

Applied Voltage Servomotor Type SGMGH -□□□		400V									
		05D□A	09D□A	13D□A	20D□A	30D□A	44D□A	55D□A	75D□A	1AD□A	1ED□A
Rated Output	kW	0.45	0.85	1.3	1.8	2.9	4.4	5.5	7.5	11	15
Rated Torque	N·m	2.84	5.39	8.34	11.5	18.6	28.4	35.0	48.0	70.0	95.4
Instantaneous Peak Torque	N·m	8.92	13.8	23.3	28.7	45.1	71.1	90.7	123	175	221
Rated Rotation Speed	min ⁻¹	1500									
Max. Rotation Speed	min ⁻¹	3000									2000
Moment of Inertia (J)	kg·m ² × 10 ⁻⁴	7.24	13.9	20.5	31.7	46.0	67.5	89.0	125	281	315
Allowable Load Moment of Inertia	as much as the Moment of Inertia	5 times or less									
Rated Power Rate	kW/s	11.2	20.9	33.8	41.5	75.3	120	137	184	174	289
Applicable Encoder	Standard	Incremental Encoder (17 bits: 16384P/R)									
	Option	Absolute Encoder (17 bits: 16384P/R)									
Basic Specifications	Time Rating	Continuous									
	Insulation Class	Class F									
	Ambient Temperature	0 to + 40°C									
	Ambient Humidity	20 to 80% (non-condensing)									
	Vibration Class	15μm or below									
	Enclosure	Totally-enclosed, self-cooled, IP67 (excluding shaft opening)									
	Vibration Resistance	Vibration acceleration 24.5m/s ²									
	Mounting	Flange-mounted									

Torque-Speed characteristics (A : Continuous Duty Zone B : Intermittent Duty Zone)



Type Designation

SGDM/SGDH Servopack

SGDH - 08 AE □ - S

-II Servopack Type
SGDM
SGDH

Capacity kW (1st & 2nd Digit)

Code	Capacity	Code	Capacity
A3	0.03	50	5
A5	0.05	60	6
1	0.1	75	7.5
2	0.2	1A	11
4	0.4	1E	15
5	0.5		
10	1		
15	1.5		
20	2		
30	3		

Phase (6th Digit) (only for SGDH type Servopack)

Blank	Three-phase (0.5 to 55kW)
S	Single-phase (750W)

Design Version A (5th Digit)
(only for SGDM type Servopack)

Model (4th Digit)
E: Speed, Torque, Position (SGDH)
D: Speed, Torque, Position (SGDM)

Source Voltage (3rd Digit)

Code	Voltage(V)
A	200
D	400

Color Code	Voltage (V)
	200
	200/400

SGDM/SGDH series

Specifications

Single-phase, 200V

Servopack Type		SGDH	A3AE	A5AE	01AE	02AE	04AE	08AE-S	15AE-S	
Applicable Servomotor		SGMAH	A3A	A5A	01A	02A	04A	08A	13A	
Basic Specifications	Input Power Supply	Main Circuit	For single-phase, 200 to 230VAC (+10%, -15%) (50/60Hz)					220 TO 230VAC +10 to-15% (50/60hZ)		
		Control Circuit	For single-phase, 200 to 230VAC (+10%, -15%) (50/60Hz)							
	Control Method		Single-phase full-wave rectification / IGBT / PWM / sine-wave current drive method							
	Feedback		Serial encoder (incremental/absolute value)							
	Conditions	Usage/Storage Temperature		0 to 55°C / -20 to 85°C						
		Usage/Storage Humidity		90%RH or less (non-condensing)						
		Altitude		1000m or less above sea level						
		Vibration/Shock Resistance		4.9m/s ² /19.6m/s ²						
	Configuration		Base mounted (Rack mount is also available)							
	Approx. Mass		kg	0.8			1.1	1.7	3.8	

Three-phase, 200V

Servopack Type		SGDH	05AE	10AE	15AE	20AE	30AE	50AE	60AE	75AE	1AAE	1EAE
Applicable Servomotor		SGMGH	05A□A	09A□A	13A□A	20A□A	30A□A	44A□A	55A□A	75A□A	1AA□A	1EA□A
Basic Specifications	Input Power Supply	Main Circuit	For Three-phase, 200 to 230VAC +10%, -15% (50/60Hz)									
		Control Circuit	For Three-phase, 200 to 230VAC +10%, -15% (50/60Hz)									
	Control Method		Single-phase full-wave rectification / IGBT / PWM / sine-wave current drive method									
	Feedback		Serial encoder (incremental/absolute value)									
	Conditions	Usage/Storage Temperature	0 to 55°C / -20 to 85°C									
		Usage/Storage Humidity	90%RH or less (non-condensing)									
		Altitude	1000m or less above sea level									
		Vibration/Shock Resistance	4.9m/s ² /19.6m/s ²									
	Configuration		Base mounted (Rack mount is also available)									
	Approx. Mass		kg 1.7		2.8		3.8	5.5	15		26	

Three-phase, 400V

Servopack Type		SGDH	05DE	10DE	15DE	20DE	30DE	50DE	60DE	75DE	1ADE	1EDE
Applicable Servomotor		SGMGH	05D□A	09D□A	13D□A	20D□A	30D□A	44D□A	55D□A	75D□A	1AD□A	1ED□A
Basic Specifications	Input Power Supply	Main Circuit	For Three-phase, 380 to 480VAC +10%, -15% (50/60Hz)									
		Control Circuit	24VDC ± 15%									
	Control Method		Three-phase full-wave rectification / IGBT / PWM / sine-wave current drive method									
	Feedback		Serial encoder (incremental/absolute value)									
	Conditions	Usage/Storage Temperature	0 to 55°C / -20 to 85°C									
		Usage/Storage Humidity	90%RH or less (non-condensing)									
		Altitude	1000m or less above sea level									
		Vibration/Shock Resistance	4.9m/s ² /19.6m/s ²									
	Configuration		Base mounted (Rack mount is also available)									
	Approx. Mass		kg 2.8			3.8		5.5	15		22	



SGDM/SGDH series

Specifications

Speed/Torque Control Mode	Performance	Speed Control Range		1:5000
		Speed Variance	Load Variance	From 0 to 100% load: ±0.01% max. (at rated speed)
			Voltage Variance	Rated voltage ±10%: 0% (at rated speed)
			Temperature Variance	25 ±25°C: ±0.1% max. (at rated speed)
		Frequency Characteristics		400Hz (at J _L = J _M)
		Torque Control Accuracy (Reproducibility)		±2%
		Soft Start Time Setting		0 to 10s (Acceleration, deceleration can each be set)
	Input Signal	Speed Reference Input	Reference Voltage	Variable setting range: ±2 to ±10VDC at rated speed / max. input voltage: ±12V
			Input Impedance	Approx. 14kΩ
		Torque Reference Input	Reference Voltage	±3VDC (forward rotation torque if positive reference) at rated speed: set at delivery Variable setting range: ±1 to ±10VDC at rated torque reference
Input Impedance			Approx. 14kΩ	
Circuit Time Constant			Approx. 47μs	
Position Control Mode	Performance	Bias Setting		0 to 450 min ⁻¹ (setting resolution: 1 min ⁻¹)
		Feed Forward Compensation		0 to 100% (setting resolution: 1%)
		Position Completed Width Setting		0 to 250 command units (setting resolution: 1 command unit)
	Input Signal	Command Pulse	Input Pulse Type	Sign +pulse train, 90° phase displacement 2-phase pulse (A-phase / B-phase), or CCW/CW pulse train
			Input Pulse Form	Line driver (5V level), open collector (5V or 12V)
			Input Pulse Frequency	0 to 500kpps (200kpps max. at open collector)
		Control Signal		Clear signal (input pulse is same as reference pulse)
I/O Signal	Position Signal Output		A-phase, B-phase, C-phase: Line driver output S-phase is for absolute encoder only	
	Sequence Input Signal		Servo ON, P control (or control mode switching, zero clamp, command pulse inhibit), forward/reverse run prohibit, alarm reset, forward/ reverse current limit (or internal speed switching)	
	Sequence Output Signal		Servo alarm, alarm codes (3-bit output): CN1 output terminal is fixed	
			It is possible to output three types of signals from among: positioning complete (speed agree), motor rotation, Servo ready, current limit, speed limit, brake release, warning, NEAR, and zero point pulse signal	
Integrated Functions	Communications	Interface	Digital operator (hand-held type), RS-422A port for PCs, etc. (RS-232C ports under some conditions)	
		1:N Communications	N may equal up to 14 when an RS-422A port is used	
		Axis Address Setting	Set by user setting	
		Functions	Status display, user constant setting, monitor display, alarm traceback display, JOG run / autotuning operations, and graphing functions for speed/torque command signal, etc.	
	Auto Tuning Function		Position/speed loop gain and integral time constant can be automatically set	
	Dynamic Brake (DB)		Operates during main power OFF, Servo alarm, Servo OFF or overtravel	
	Regenerative Processing		Regenerative resistor externally mounted (option)	
	Overtravel (OT) Prevention Function		DB stop, deceleration stop or coast to stop during P-OT, N-OT operation	
	Encoder Divider Function		Optional division possible	
	Electronic Gearing		0.01<A/B<100	
	Internal Speed Setting Function		3 speeds may be set internally	
	Protective Functions		Overcurrent, overvoltage, insufficient voltage, overload, main circuit sensor error, heatsink overheat, power phase loss, overflow, overspeed, encoder error, runaway,CPU error, parameter error, etc.	
	Analog Monitor Functions for Supervision		Integrates analog monitor connectors for supervision of the speed and torque reference signals, etc.	
	Display Functions		Charge, Power, 7-segment LED5 (Integrated digital operator function)	
	Others		Reverse connection, zero search, automatic motor discrimination function, and DC reactor connection terminal for high frequency power suppression function (except: 6 to 15kW)	

Industry's first truly
Plug and Play
Servo Drive !

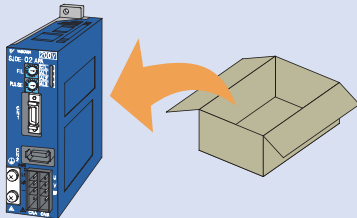


Features

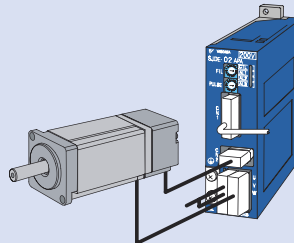
- 100W to 750W
- No parameters setting required
- Encoder resolution 10,000 pulses per revolution
- Selectable electronic gearing ratio (10000 ppr, 5000 ppr, 2500 ppr, 1000 ppr)
- Automatic real time tuning to adjust for dynamically changing load condition
- Mechatrolink- II communication (Optional)

Fast & easy setup

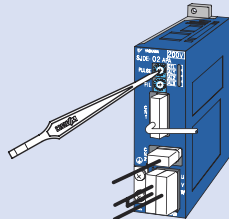
- 1 Unpacking**
Remove the Servopack from the box.



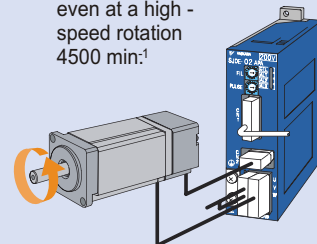
- 2 Installation and wiring**
Connect the cables for the power supply, signal lines, and drop a motor.



- 3 Reference pulse setting**
Select the reference pulse switch for your suitable controller. No parameter settings and gain adjustments are required.



- 4 Setup completion**
The motor is ready to run with the reference from the controller. The required torque is possible even at a high - speed rotation 4500 min:⁻¹



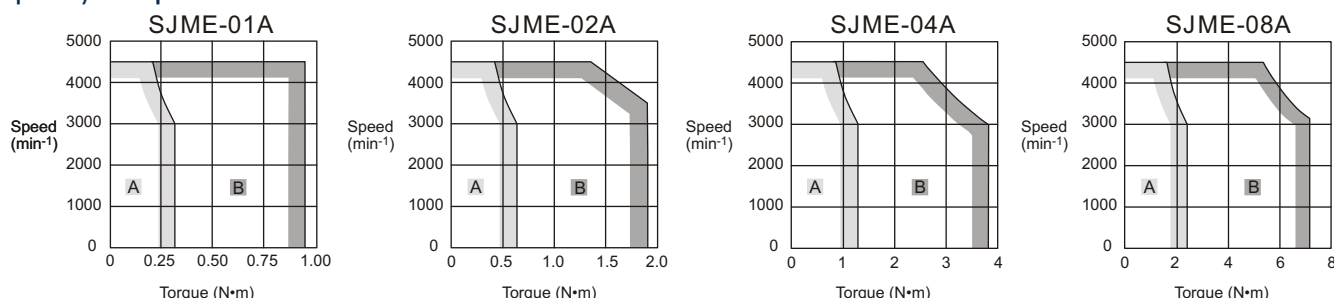
Specifications

Voltage		200 VAC				Description
Servomotor Model: SJME		01	02	04	08	
Applicable Servopack	SJDE	01	02	04	08	—
Rated Output*1	W	100	200	400	750	Motor output at the rated operating point
Rated Torque*1,*2	N · m	0.318	0.637	1.27	2.39	Torque at the rated operating point
Instantaneous Peak Torque*1	N · m	0.955	1.91	3.82	7.16	Maximum instantaneous torque of the motor
Rated Current*1	Amp	0.84	1.1	2.0	3.7	Current flowing to the motor at the rated operating point
Instantaneous Max. Current*1	Amp	2.5	3.3	6.0	11.1	Maximum instantaneous current that is allowed to flow to the motor
Rated Speed*1	min-1	3000				Speed at the rated operating point
Max. Speed*1	min-1	4500				Highest possible speed
Torque Constant	N · m / Amp	0.413	0.645	0.682	0.699	Generated torque ratio for current flowing to the motor
Rotor Moment of Inertia	kg · m ² × 10 ⁻⁴	0.0634	0.330	0.603	1.50	Inertia moment at the rotor shaft
Rated Power Rate*1	kW/s	16.0	12.3	26.7	38.1	Motor output per unit time
Rated Angular Acceleration*1	rad/s ²	50200	19300	21100	15900	Theoretical angular acceleration(also called torque-to-inertia ratio) at the rated torque
Time Rating		Continuous				*Continuous rating" means that the temperature of the Servomotor in continuous operation under specified conditions will not exceed specified temperature or other limitation
Thermal Class		B				Highest allowable temperature for armature winding: 130°C
Vibration Class		15μm or below				The maximum vibration amplitude of the motor expressed in units of micrometers on the condition that the vibration is measured with a vibrometer parallel to the shaft and in two directions perpendicular to the shaft.
Withstand Voltage		1500 VAC for one minute				—
Insulation Resistance		500 VDC, 10 M				—
Enclosure		Totally enclosed, self-cooled, IP55 (excluding shaft opening and connectors)				Level of protection from dust and water drops
Impact Resistance		Impact acceleration:490 m/s ² in three directions — vertical, side to side, and front to back. Impact occurrences: 2				Impact resistance of the motor in three directions (up and down, left and right, and back and forth) with the motor shaft mounted horizontally
Vibration Resistance		Vibration acceleration: 49 m/s ² in three directions — vertical, side to side, and front to back.				Vibration resistance of the motor in three directions (up and down, left and right, and back and forth) with the motor shaft mounted horizontally

*1. These items and speed/torque characteristics quoted in combination with an SJDE Servopack are at an armature winding temperature of 100°C. Other values are quoted at 20°C

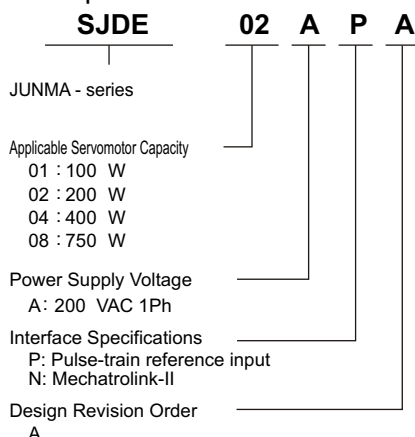
*2. The rated torques listed here are the values for the continuous allowable torque at 40°C with an aluminum heatsink (250 mm × 250 mm × 6 mm) attached

Speed / Torque characteristics

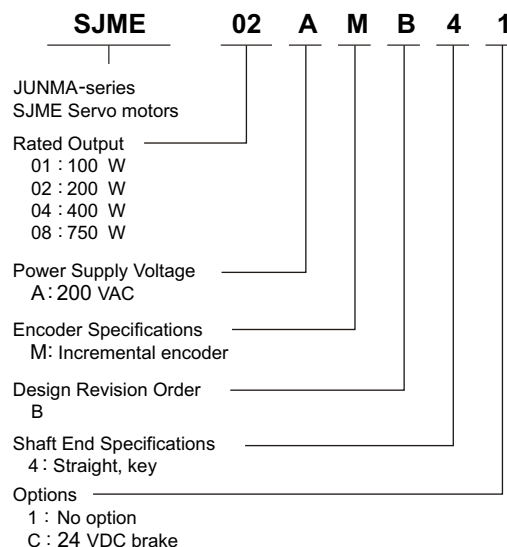


Model Designations

Servopack



Servomotors



Specifications

Servopack model SJDE-			01APA	02APA	04APA	08APA
Max. applicable Servomotor capacity [kW]			0.1	0.2	0.4	0.75
Continuous output current [Amps]			0.84	1.1	2.0	3.7
Instantaneous max. output current [Amps]			2.5	3.3	6.0	11.1
Input power supply (for main circuit and control circuit)	Voltage		Single-phase 200 V to 230 VAC, +10% to -15%			
	Frequency		50/60Hz ± 5%			
	Capacity at rated output [kVA]		0.40	0.75	1.2	2.2
Power loss at rated output [W]			14	16	24	35
Input control method			Capacitor-input type, single-phase full-wave rectification with resistance to prevent inrush currents			
Output control method			PWM control, sine wave power driven system			
Feedback			Analog output encoder			
Allowable load inertia [kgm ²]*1			0.6 x 10 ⁻⁴	3 x 10 ⁻⁴	5 x 10 ⁻⁴	10 x 10 ⁻⁴
I/O Signals	Input signal for Reference Designated pulse type and Pulse resolution with PULSE switch	Pulse type	Select one of the following signals: 1. CCW + CW 2. Sign + pulse train 3. CCW + CW (logic reversal) 4. Sign + pulse train (logic reversal)			
		Pulse resolution	Select one of the following signals: 1. 1000 pulses/rev (Open collector/line driver) 75 kpps max. 2. 2500 pulses/rev (Open collector/line driver) 187.5 kpps max. 3. 5000 pulses/rev (Line driver) 375 kpps max. 4. 10000 pulses/rev (Line driver) 750 kpps max.			
	Clear input signal		Clears the positioning error when turned ON			
	Servo ON input signal		Turns the Servomotor ON or OFF			
	Alarm output signal		OFF if an alarm occurs Note: OFF for 2s when power is turned ON			
	Brake output signal		External signal to control brakes. Turn ON to release the brake			
	Positioning completed output signal		ON if the current position is equal to the reference position ± 10 pulses			
	Origin output signal		ON if the motor is at the origin. (Width: 1/500 rev) Note: Use the pulse edge that changes the signal from OFF to ON			
Built-in functions	Dynamic brake (DB)		Operated at main power OFF, Servo alarm, Servo OFF (OFF after motor stops; ON if the motor power is off)			
	Regenerative processing		Optional (If the regenerated enery is too large, install a regenerative unit)			
	Protection		Speed errors, overload, encoder errors, voltage errors, overcurrents, disablement of the built-in cooling fan, system errors Note: No built-in circuit for ground protection			
	LED display		5 (PWR, REF, AL1, AL2, AL3)			
	Reference filter		Select one of eight levels with FIL switch			
Cooling method			Forced cooling (built-in fan)			
Operating temperature			0°C to + 55°C			
Operating humidity			90% RH or less (with no condensation)			
Storage temperature			-20°C to + 70°C			
Storage humidity			90% RH or less (with no condensation)			
Installation site			• Free of corrosive gases • Free of dust and iron powder • Clean and dry			
Altitude			1000 m or below			
Vibration resistance			4.9m/s ²			
Shock resistance			19.6m/s ²			
Operating conditions			Installation category (overvoltage category): Pollution degree: 2 Protection class: IP1X (EN50178)			

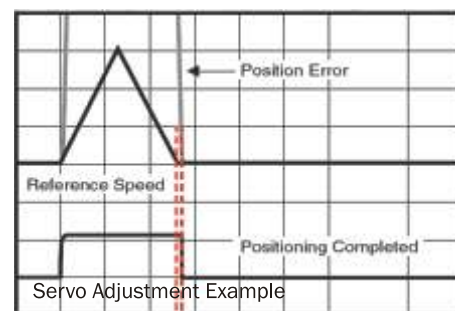
*1. Be sure to use the motor within the allowable load inertia moment. The operation of the motor will become unstable if the allowable load Inertia moment is exceeded

- V Delivers the highest performance in industry

SIGMA-V series Servo Drives - 50W to 15kW

Build the machine you've dreamed of with Sigma-V

Features



Settling time 0 to 4 ms!
(Σ-V)

Simple Tuning

Get up and running quickly after hooking up the motor

- ♦ New tuning-less function

Even without Servo adjustment and with load changes, oscillation and vibration free drive is possible up to 20 times the load movement of Inertia.

Setting time: 100 to 150 ms level

Minimize setting time with less vibration

- ♦ New advanced autotuning

The reference filter and feedback gain adjustment functions have a new automatic feed forward gain adjustment for optimal adjustment performance. The friction compensation function automatically cancels out the effect of friction on machine characteristics.

Setting time: 10 ms level

Fine tuning is a must

- ♦ New 1-parameter tuning

Fine tuning can tweak machine performance to the max

Setting time: 0 to 4 ms level

Encoder Resolution

Encoder with
20 bit
(1,048,576)
pulses / revolution

Enhanced Vibration Suppression

Improved tracking
and settling time

USB1.1 Support

Realtime trace of
adjustment state
means you can
check instantly

Type Designation

SGMJV-01 A D A 2 1

Sigma V Servomotor Type

SGMJV (Medium Inertia, Small capacity)

SGMAV (Low Inertia, Small capacity)

SGMGV (Medium Inertia, Medium capacity)

Capacity KW (1st & 2nd Digit)

Code	SGMJV	SGMAV	SGMGV
A5	0.05	0.05	
01	0.1	0.1	
C2		0.15	
02	0.2	0.2	
03			0.3
04	0.4	0.4	
05			0.45
06		0.55	
08	0.75	0.75	
09			0.85
13			1.3
20			1.8
30			2.9
44			4.4
55			5.5
75			7.5
1A			11
1E			15

Voltage (3rd Digit)

Code	Voltage(V)
A	200
D	400

Brake, Oil Seal Specifications (7th Digit)

1	No Brake, No Oil Seal
S	Oil Seal
C	24VDC Brake
E	Oil Seal +24VDC Brake

Shaft End Specifications (6th Digit)

Code	Shaft End	Type		
		SGMJV	SGMAV	SGMGV
2	Straight without key (standard)	0	0	0
6	Straight with key and tap (optional)	0	0	0
8	Straight without key and with tap (optional)	0	0	
B	With two flat seats (optional)	0	0	

Design Procedure (5th Digit)

(A)

Serial Encoder Specifications (4th Digit)

Code	Shaft End	Type		
		SGMJV	SGMAV	SGMGV
3	20-Bit Absolute	0	0	0
D	20-Bit Incremental	0	0	0
A	13-Bit Incremental	0		

Color Code	Voltage (V)
	200
	200/400

Ratings & Specifications

Series	Capacity (kW)	Rated Torque (N.m)	Peak Torque (N.m)	Rated Speed (Peak Speed) (rpm)	Maximum Inertia (kg.m2 x e-4)	Allowed Load Moment of Inertia	Rate Power Rate (kW/s)	Basic specifications						
SGMJV Medium inertia, low capacity	0.05	0.159	0.557	3000 (6000)	0.0414	20 times	6.11	Enclosure: IP65 (ex. shaft opening)	Insulation Resistance: 500 VDC, 10 M min.	Operation Type: Continuous	Ambient Temperature: 0 to +40°C	Ambient Humidity: 20 to 80% (non-condensing)	Vibration Class: V15	
	0.1	0.318	1.11		0.0665		15.2							
	0.2	0.637	2.23		0.259	15 times	15.7							
	0.4	1.27	4.46		0.442	10 times	36.5							
	0.75	2.39	8.36		1.57		36.3							
SGMAV Low inertia, small capacity	0.05	0.159	0.477	3000 (6000)	0.0242	30 times	10.4							Enclosure: IP67 (ex. shaft opening)
	0.1	0.318	0.955		0.038		26.6							
	0.15	0.477	1.43		0.0531		42.8							
	0.2	0.637	1.91		0.116		35							
	0.4	1.27	3.82		0.19	20 times	84.9							
	0.55	1.75	5.25		0.326		93.9							
	0.75	2.39	7.16		0.769		74.1							
SGMGV Medium inertia, medium capacity	0.3	1.96	5.88	1500 (3000)	2.48	5 times	15.5	Enclosure: IP67 (ex. shaft opening)						
	0.45	2.86	8.92		3.33		24.6							
	0.85	5.39	13.8		13.9		20.9							
	1.3	8.34	23.3		19.9		35							
	1.8	11.5	28.7		26		50.9							
	2.9	18.6	45.1		46		75.2							
	4.4	28.4	71.1		67.5		119							
	5.5	35	87.6		89		138							
	7.5	48	119		125		184							
	11	70	175	1500 (2000)	242	202								
	15	95.4	224		303	300								

Ratings and Specifications (SGMJV series)

Time Rating: Continuous

Vibration Class: V15

Insulation Resistance: 500 VDC, 10 M Ω min.

Ambient Temperature: 0 to 40°C

Excitation: Permanent magnet

Mounting: Flange-mounted

Thermal Class: B

Withstand Voltage: 1500 VAC for one minute

Enclosure: Totally enclosed, self-cooled, IP65
(except for shaft opening)

Ambient Humidity: 20% to 80% (no condensation)

Drive Method: Direct drive

Rotation Direction: Counter clockwise (CCW) with forward run
reference when viewed from the load side

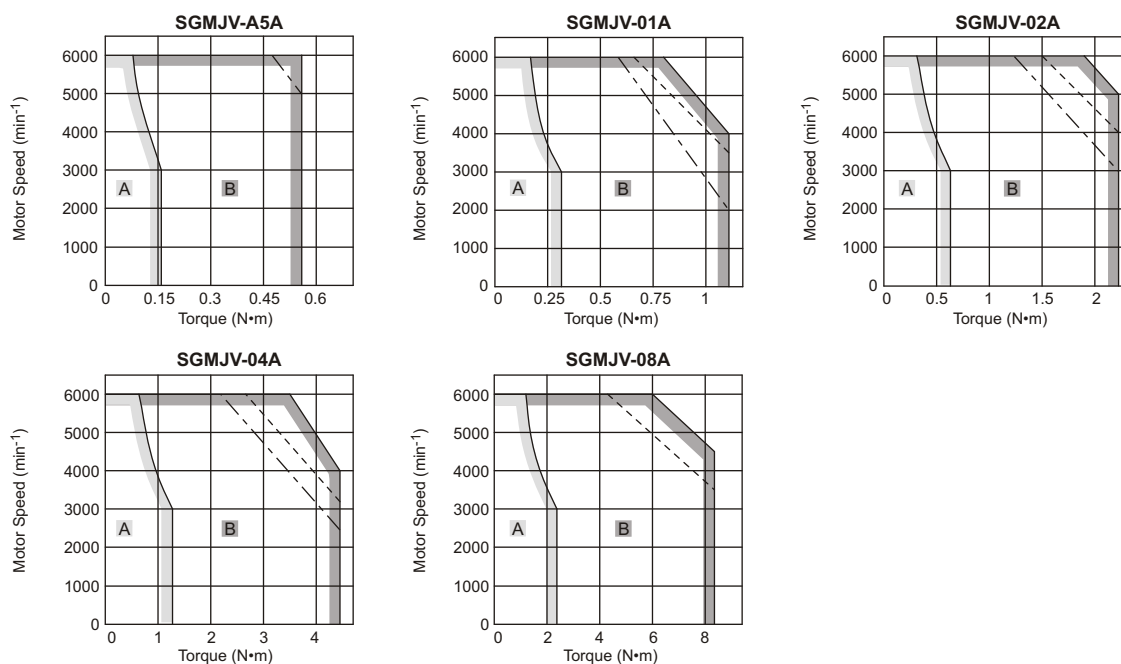
Voltage		200 V				
Servomotor Model: SGMJV-□□□		A5A	01A	02A	04A	08A
Rated Output*1	W	50	100	200	400	750
Rated Torque*1, *2	N•m	0.159	0.318	0.637	1.27	2.39
Instantaneous Peak Torque*1	N•m	0.557	1.11	2.23	4.46	8.36
Rated Current*1	Arms	0.61	0.84	1.6	2.7	4.7
Instantaneous Max. Current*1	Arms	2.1	2.9	5.8	9.3	16.9
Rated Speed*1	min ⁻¹	3000				
Max.Speed*1	min ⁻¹	6000				
Torque Constant	N•m/Arms	0.285	0.413	0.435	0.512	0.544
Rotor Moment of Inertia	x 10 ⁻⁴ kg•m ²	0.0414 (0.0561)	0.0665 (0.0812)	0.259 (0.323)	0.442 (0.506)	1.57 (1.74)
Rated Power Rate*1	KW/s	6.11	15.2	15.7	36.5	36.3
Rated Angular Acceleration*1	rad/s ²	38400	47800	24600	28800	15200
Applicable Servopack	SGDV-□□□□	R70□	R90□	1R6A, 2R1F	2R8□	5R5A

*1. These items and torque-motor speed characteristics quoted in combination with an SGDV Servopack are at an armature winding temperature of 100°C.
Other values quoted are at 20°C.

*2. Rated torques are continuous allowable torque values at 40°C with an aluminium heat sink of the following dimensions attached.
SGMJV-A5A, -01A: 200 mm x 200 mm x 6 mm
SGMJV-02A, -04A, -08A: 250 mm x 250 mm x 6 mm

Note: The values in parentheses are for servomotors with holding brakes.

• Torque-Motor Speed Characteristics A : Continuous Duty Zone B : Intermittent Duty Zone^(Note3)



Notes: 1. The Solid, dotted, and dashed-dotted lines of the intermittent duty zone indicate the characteristics when a servomotor runs with the following combinations:

- The solid line: With a three-phase 200 V or a single-phase 230 V Servopack
- The dotted line: With a single-phase 200 V Servopack
- The dashed-dotted line: With a single-phase 100 V Servopack

An SGMJV-A5A servomotor has the same characteristics in combination with three-phase 200 V and single-phase 200 V servopack.

2. The characteristics of the intermittent duty zone differ depending on the supply voltages.

3. When the effective torque during intermittent duty is within the rated torque, the servomotor can be used within the intermittent duty zone.

4. When the main circuit cable length exceeds 20 m, note that the intermittent duty zone of the Torque-Motor Speed Characteristics will shrink as the line-to-line voltage drops.

Ratings and Specifications (SGMAV series)

Time Rating: Continuous

Vibration Class: V15

Insulation Resistance: 500 VDC, 10 M Ω min.

Ambient Temperature: 0 to 40°C

Excitation: Permanent magnet

Mounting: Flange-mounted

Thermal Class: B

Withstand Voltage: 1500 VAC for one minute

Enclosure: Totally enclosed, self-cooled, IP65
(except for shaft opening)

Ambient Humidity: 20% to 80% (no condensation)

Drive Method: Direct drive

Rotation Direction: Counterclockwise (CCW) with forward run
reference when viewed from the load side

Voltage		200 V							
Servomotor Model: SGMAV-□□□		A5A	01A	C2A	02A	04A	06A	08A	10A
Rated Output*1	W	50	100	150	200	400	550	750	1000
Rated Torque*1, *2	N·m	0.159	0.318	0.477	0.637	1.25	1.75	2.39	3.18
Instantaneous Peak Torque*1	N·m	0.477	0.955	1.43	1.91	3.82	5.25	7.16	9.55
Rated Current*1	Arms	0.66	0.91	1.3	1.5	2.6	3.8	5.3	7.4
Instantaneous Max. Current*1	Arms	2.1	2.8	4.2	5.3	8.5	12.2	16.6	23.9
Rated Speed*1	min ⁻¹	3000							
Max. Speed*1	min ⁻¹	6000							
Torque Constant	N·m/Arms	0.265	0.375	0.381	0.450	0.539	0.496	0.487	0.467
Rotor Moment of Inertia	x 10 ⁻⁴ kg·m ²	0.0242 (0.0389)	0.0380 (0.0527)	0.0531 (0.0678)	0.116 (0.180)	0.190 (0.254)	0.326 (0.403)	0.769 (0.940)	1.20 (1.41)
Rated Power Rate*1	KW/s	10.4	26.6	42.8	35.0	84.9	93.9	74.1	84.1
Rated Angular Acceleration*1	rad/s ²	65800	83800	89900	54900	67000	53700	31000	26500
Applicable Servopack	SGDV-□□□□	R70□	R90□	1R6A, 2R1F		2R8□	5R5A	5R5A	120A

*1. These items and torque-motor speed characteristics quoted in combination with an SGDV Servopack are at an armature winding temperature of 100°C.
Other values quoted are at 20°C.

*2. Rated torques are continuous allowable torque values at 40°C with an aluminium heat sink of the following dimensions attached.

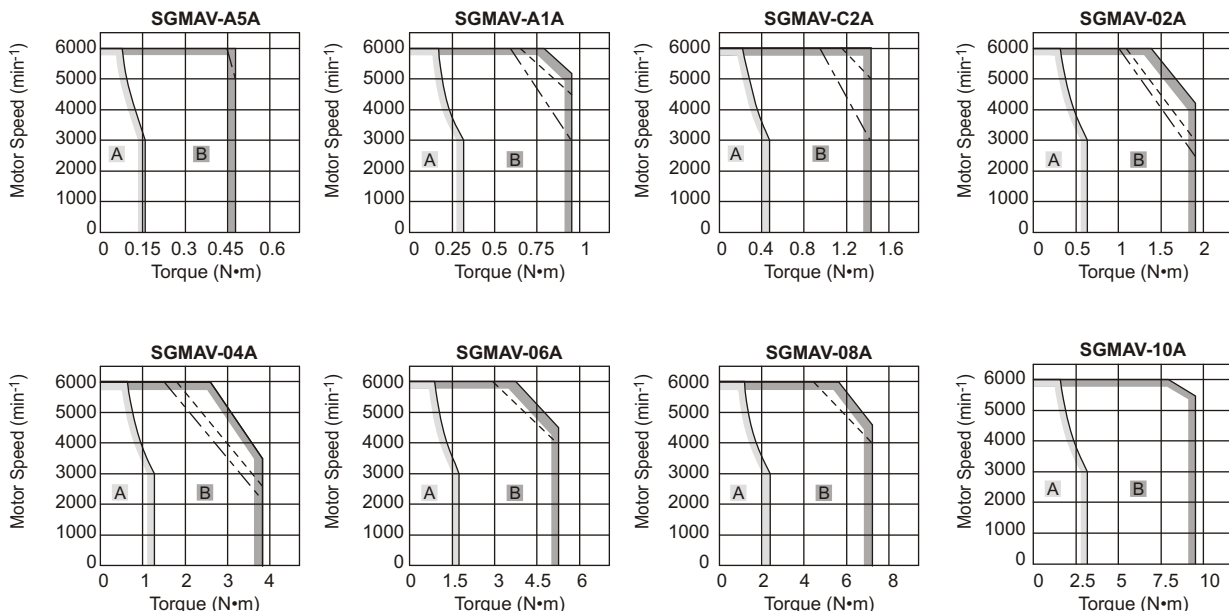
SGMAV-A5A, -01A: 200 mm x 200 mm x 6 mm

SGMAV-C2A, -02A, -04A, -06A, -08A: 250 mm x 250 mm x 6 mm

SGMAV-10A: 300 mm x 300 mm x 12 mm

Note: The values in parentheses are for servomotors with holding brakes.

• Torque-Motor Speed Characteristics A : Continuous Duty Zone B : Intermittent Duty Zone^(Note3)



Notes: 1. The Solid, dotted, and dashed-dotted lines of the intermittent duty zone indicate the characteristics when a servomotor runs with the following combinations:

- The solid line: With a three-phase 200 V or a single-phase 230 V Servopack
- The dotted line: With a single-phase 200 V Servopack
- The dashed-dotted line: With a single-phase 100 V Servopack

An SGMAV-A5A servomotor has the same characteristics in combination with three-phase 200 V and single-phase 200 V Servopacks.

2. The characteristics of the intermittent duty zone differ depending on the supply voltages.

3. When the effective torque during intermittent duty is within the rated torque, the servomotor can be used within the intermittent duty zone.

4. When the main circuit cable length exceeds 20 m, note that the intermittent duty zone of the Torque-Motor Speed Characteristics will shrink as the line-to-line voltage drops.

Ratings and Specifications (SGMGV series)

Time Rating: Continuous

Vibration Class: V15

Insulation Resistance: 500 VDC, 10 M Ω min.

Ambient Temperature: 0 to 40°C

Excitation: Permanent magnet

Mounting: Flange-mounted

Thermal Class: F

Withstand Voltage: 1500 VAC for one minute (200-V Class)
1800 VAC for one minute (400-V Class)

Enclosure: Totally enclosed, self-cooled, IP67
(except for shaft opening)

Ambient Humidity: 20% to 80% (no condensation)

Drive Method: Direct drive

Rotation Direction: Counter clockwise (CCW) with forward run
reference when viewed from the load side

200-V Class

Servomotor Model: SGMGV-□□□		03A	05A	09A	13A	20A	30A	44A	55A	75A	1AA	1EA
Rated Output*1	kW	0.3	0.45	0.85	1.3	1.8	2.9	4.4	5.5	7.5	11	15
Rated Torque*1	N•m	196	2.86	5.39	8.34	11.5	18.6	28.4	35.0	48.0	70.0	95.4
Instantaneous Peak Torque*1	N•m	5.88	8.92	13.8	23.3	28.7	45.1	71.1	87.6	119	175	224
Rated Current*1	Arms	2.8	3.8	6.9	10.7	16.7	23.8	32.8	42.1	54.7	58.6	78
Instantaneous Max. Current*1	Arms	8	11	17	28	42	56	84	110	130	140	170
Rated Speed*1	min ⁻¹	1500										
Max. Speed*1	min ⁻¹	3000										2000
Torque Constant	N•m/Arms	0.776	0.854	0.859	0.891	0.748	0.848	0.934	0.871	0.957	1.32	1.37
Rotor Moment of Inertia	x10 ⁻⁴ kg•m ²	2.48 (2.73)	3.33 (3.58)	13.9 (16)	19.9 (22)	26 (28.1)	46 (54.5)	67.5 (76.0)	89.0 (97.5)	125 (134)	242 (261)	303 (341)
Rated Power Rate*1	kW/s	15.5 (14.1)	24.6 (22.8)	20.9 (18.2)	35.0 (31.6)	50.9 (47.1)	75.2 (63.5)	119 (106)	138 (126)	184 (172)	202 (188)	300 (283)
Rated Angular Acceleration*1	rad/s ²	7900 (7180)	8590 (7990)	3880 (3370)	4190 (3790)	4420 (4090)	4040 (3410)	4210 (3740)	3930 (3590)	3840 (3580)	2890 (2680)	3150 (2960)
Applicable Servopack	SGDV-□□□□	3R8A	3R8A	7R6A	120A	180A	330A 220A*2	330A	470A	550A	590A	780A

*1. These items and torque-motor speed characteristics quoted in combination with a Servopack are at an armature winding temperature of 20°C.

*2. Some restrictions apply when using an SGDV-200A Servopack in combination with an SGMGV-30A servomotor.

Notes: 1. The values in parentheses are for servomotors with holding brakes.
2. The above specifications show the values under the cooling condition when the following heat sinks are mounted on the servomotors.
SGMGV-03A/-05A: 250 mm x 250 mm x 6 mm (aluminum)
SGMGV-09A/-13A/-20A: 400 mm x 400 mm x 20 mm (iron)
SGMGV-30A/-44A/-55A/-75A: 550 mm x 550 mm x 30 mm (iron)
SGMGV-1AA/-1EA: 650 mm x 650 mm x 35 mm (iron)

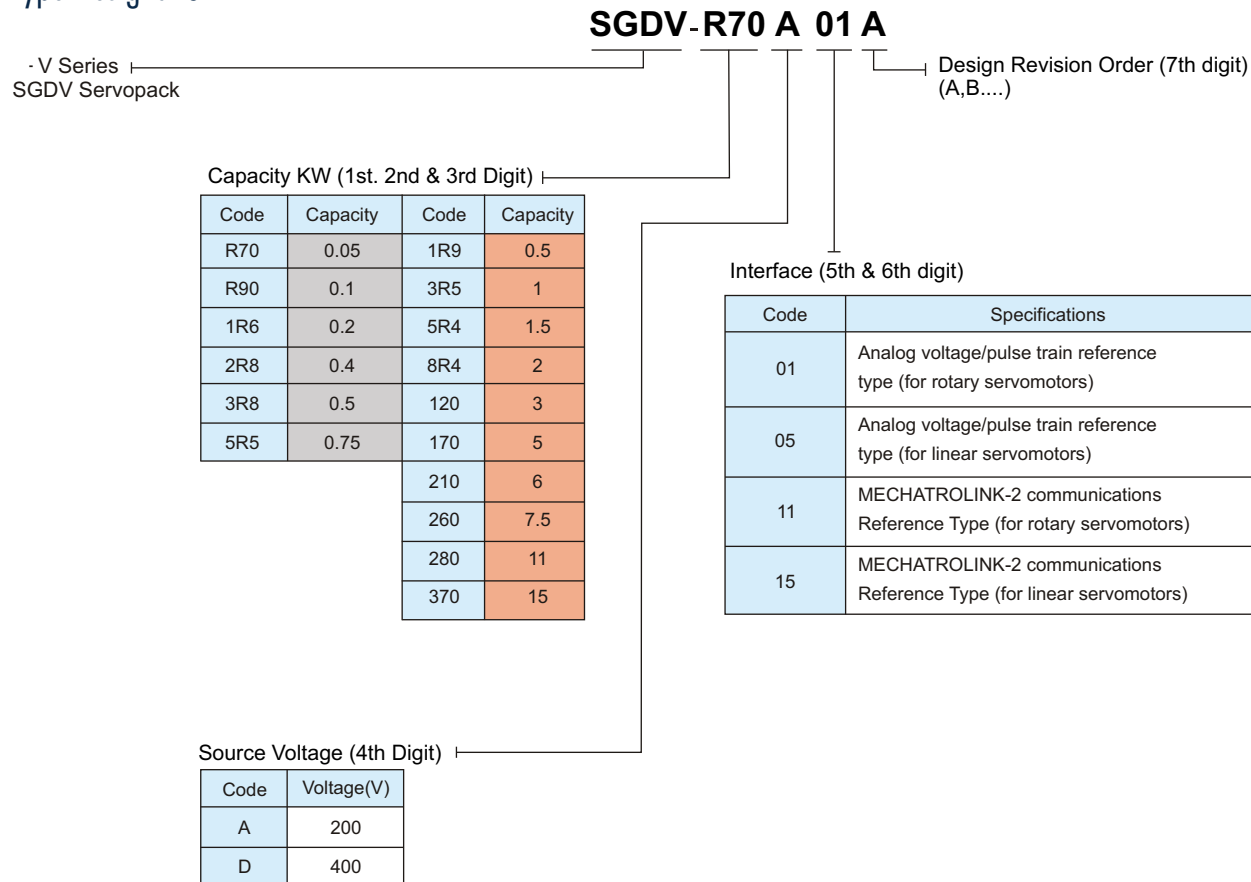
400-V Class

Servomotor Model: SGMGV-□□□		03D	05D	09D	13D	20D	30D	44D	55D	75D	1AD	1ED
Rated Output*	kW	0.3	0.45	0.85	1.3	1.8	2.9	4.4	5.5	7.5	11	15
Rated Torque*	N•m	196	2.86	5.39	8.34	11.5	18.6	28.4	35.0	48.0	70.0	95.4
Instantaneous Peak Torque*	N•m	5.88	8.92	13.8	23.3	28.7	45.1	71.1	87.6	119	175	224
Rated Current*	Arms	1.4	1.9	3.5	5.4	8.4	11.9	16.5	20.8	25.7	28.1	37.2
Instantaneous Max. Current*	Arms	8	11	17	28	42	56	84	110	130	140	170
Rated Speed*	min ⁻¹	1500										
Max. Speed*	min ⁻¹	3000										2000
Torque Constant	N•m/Arms	1.55	1.71	1.72	1.78	1.50	1.70	1.93	1.80	1.92	2.64	2.74
Rotor Moment of Inertia	x10 ⁻⁴ kg•m ²	2.48 (2.73)	3.33 (3.58)	13.9 (16)	19.9 (22)	26 (28.1)	46 (54.5)	67.5 (76.0)	89.0 (97.5)	125 (134)	242 (261)	303 (341)
Rated Power Rate*	kW/s	15.5 (14.1)	24.6 (22.8)	20.9 (18.2)	35.0 (31.6)	50.9 (47.1)	75.2 (63.5)	119 (106)	138 (126)	184 (172)	202 (188)	300 (283)
Rated Angular Acceleration*	rad/s ²	7900 (7180)	8590 (7990)	3880 (3370)	4190 (3790)	4420 (4090)	4040 (3410)	4210 (3740)	3930 (3590)	3840 (3580)	2890 (2680)	3150 (2960)
Applicable Servopack	SGDV-□□□□	1R9D	1R9D	3R5D	5R4D	8R4D	120D	170D	210D	260D	280D	370D

*1: These items and torque-motor speed characteristics quoted in combination with a Servopack are at an armature winding temperature of 20°C.

Notes: 1. The values in parentheses are for servomotors with holding brakes.
2. The above specifications show the values under the cooling condition when the following heat sinks are mounted on the servomotors.
SGMGV-03D/-05D: 250 mm x 250 mm x 6 mm (aluminum)
SGMGV-09D/-13D/-20D: 400 mm x 400 mm x 20 mm (iron)
SGMGV-30D/-44D/-55D/-75D: 550 mm x 550 mm x 30 mm (iron)
SGMGV-1AD/-1ED: 650 mm x 650 mm x 35 mm (iron)

Type Designation



Color Code	Voltage (V)
	200
	200/400

Connector list for - II SGMAH, SGMGH series (with brake and without brake)

- II --SGMAH Without Brake Connectors

Sr. No.	Category	Model
1	Interface Connector CN1	JZSP-CKI9
2	Motor Power Mating Connector without brake	JZSP-CMM9-1
3	Drive CN2 Amplifier Mating Connector	JZSP-CMP9-1
4	Motor Encoder Mating Connector	JZSP-CMP9-2

- II --SGMAH With Brake Connectors

Sr. No.	Category	Model
1	Interface Connector CN1	JZSP-CKI9
2	Motor Power Mating Connector with brake	JZSP-CMM9-2
3	Drive CN2 Amplifier Mating Connector	JZSP-CMP9-1
4	Motor Encoder Mating Connector	JZSP-CMP9-2

- II --SGMGH Without Brake (1.8kW,2.9kW,4.4kW) Connectors

Sr. No.	Category	Model
1	Interface Connector CN1	JZSP-CKI9
2	Motor Connector Straight-type (2.0,3.0&4.4kW)	MS3106B22-22S
3	Motor Connector cable clamp	MS3057-12A
4	Encoder Straight-type Connector	MS3106B20-29S
5	Encoder Connector cable clamp	MS3057-12A
6	Drive CN2 Amplifier Mating Connector	JZSP-CMP9-1

- II --SGMGH With Brake (1.8kW,2.9kW,4.4kW) Connectors

Sr. No.	Category	Model
1	Interface Connector CN1	JZSP-CKI9
2	Motor Connector Straight-type (2.0,3.0&4.4kW)	MS3106B24-10S
3	Motor Connector cable clamp	MS3057-16A
4	Encoder Straight-type Connector	MS3106B20-29S
5	Encoder Connector cable clamp	MS3057-12A
6	Drive CN2 Amplifier Mating Connector	JZSP-CMP9-1

- II --SGMGH Without Brake (0.45kW,0.85kW,1.3kW) Connectors

Sr. No.	Category	Model
1	Interface Connector CN1	JZSP-CKI9
2	Motor Connector Straight-type (0.45,0.9&1.3kW)	MS3106B18-10S
3	Motor Connector cable clamp	MS3057-10A
4	Encoder Straight-type Connector	MS3106B20-29S
5	Encoder Connector cable clamp	MS3057-12A
6	Drive CN2 Amplifier Mating Connector	JZSP-CMP9-1

- II --SGMGH With Brake (0.45kW,0.85kW,1.3kW) Connectors

Sr. No.	Category	Model
1	Interface Connector CN1	JZSP-CKI9
2	Motor Connector Straight-type (0.45,0.9&1.3kW)	MS3106B20-15S
3	Motor Connector cable clamp	MS3057-12A
4	Encoder Straight-type Connector	MS3106B20-29S
5	Encoder Connector cable clamp	MS3057-12A
6	Drive CN2 Amplifier Mating Connector	JZSP-CMP9-1

- II --SGMGH Without Brake (5.5kW,7.5kW,11kW,15kW) Connectors

Sr. No.	Category	Model
1	Interface Connector CN1	JZSP-CKI9
2	Motor Connector Straight-type (5.5kW,7.5kW,11kW,15kW)	MS3106B32-17S
3	Motor Connector cable clamp	MS3057-20A
4	Encoder Straight-type Connector	MS3106B20-29S
5	Encoder Connector cable clamp	MS3057-12A
6	Drive CN2 Amplifier Mating Connector	JZSP-CMP9-1

- II --SGMGH With Brake(5.5kW,7.5kW,11kW,15kW) Connectors

Sr. No.	Category	Model
1	Interface Connector CN1	JZSP-CKI9
2	Motor Connector Straight-type (5.5kW,7.5kW,11kW,15kW)	MS3106B32-17S
3	Motor Connector cable clamp	MS3057-20A
4	Brake power supply Connector	MS3106A10SL-3S
5	Cable clamp for brake power Connector	MS3057-4A
6	Encoder Straight-type Connector	MS3106B20-29S
7	Encoder Connector cable clamp	MS3057-12A
8	Drive CN2 Amplifier Mating Connector	JZSP-CMP9-1

Connector list for JUNMA Series

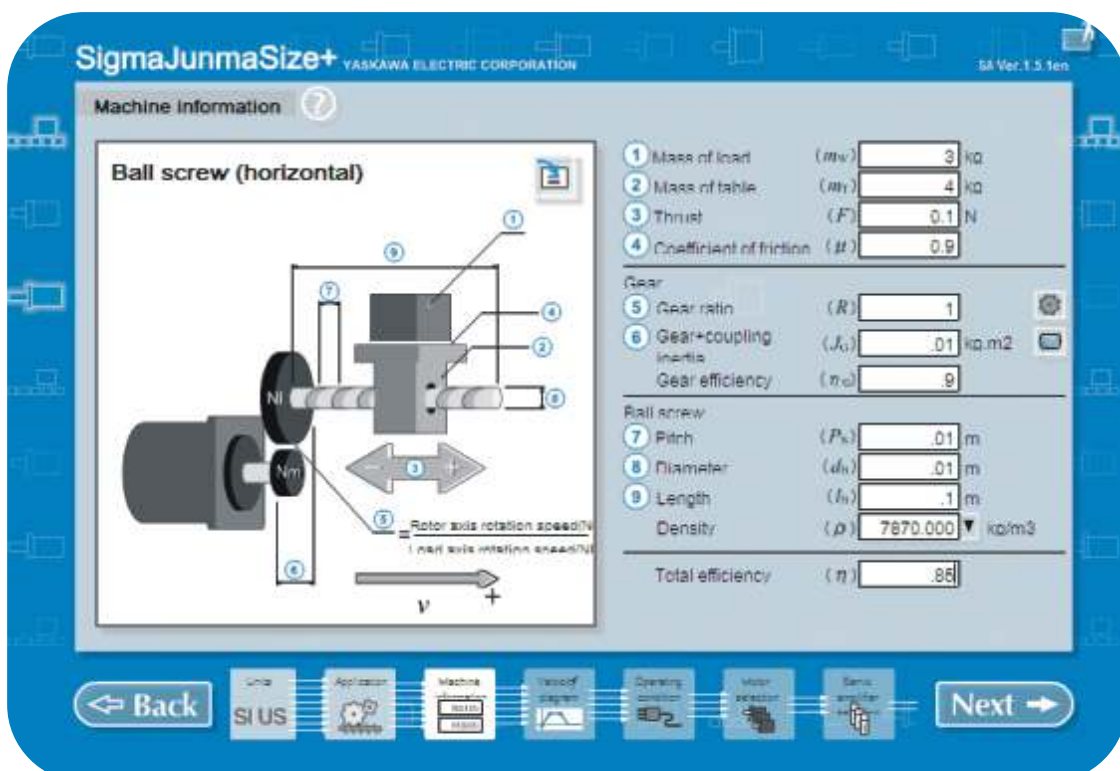
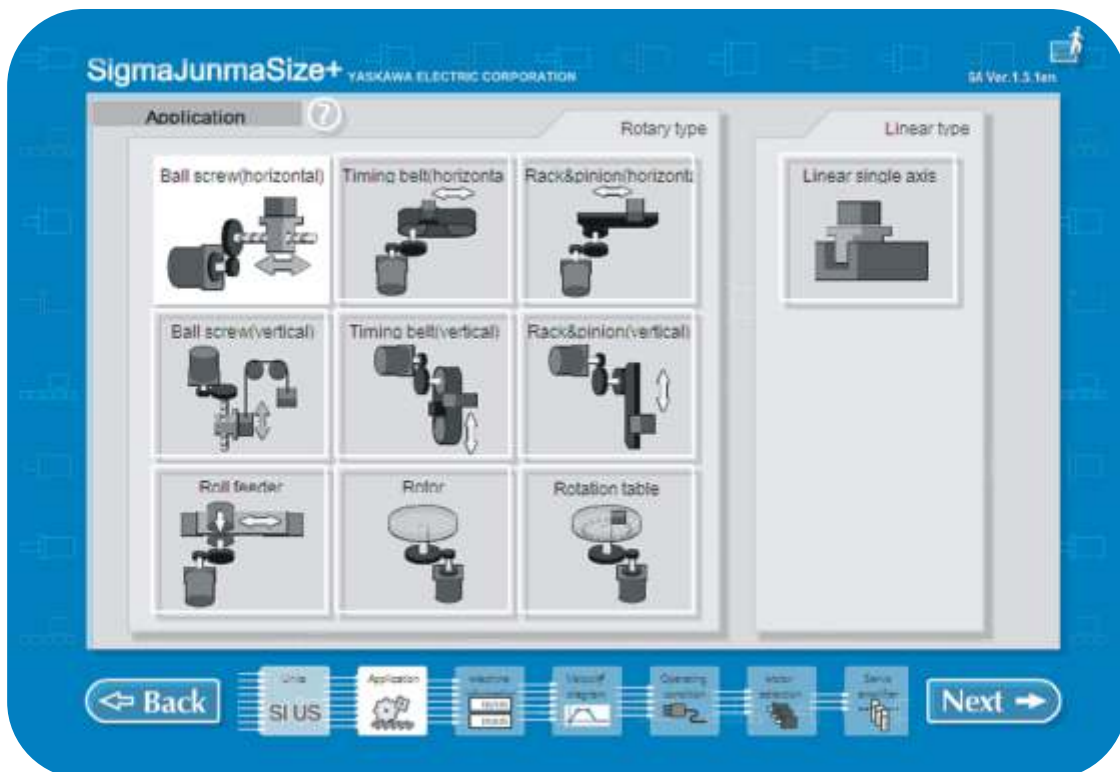
Sr. No.	Category	Model
1	Drive I/P power Connector (JST Made)	JZSP-CHG9-1
2	CN1-Interface Connector(14 pin connect-Plug)(3M)	JZSP-CHI9-1
3	Motor end Connector receptacle housing(Molex)	JZSP-CHM9-1
4	Drive to motor O/P power Connector (JST Made)	JZSP-CHM9-2
5	Encoder end Connector receptacle housing(Molex)	JZSP-CHP9-1
6	Drive end encoder Connector Shell Kit(3M)	JZSP-CHP9-2

*For prefab cables, please contact branch office.

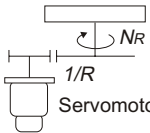
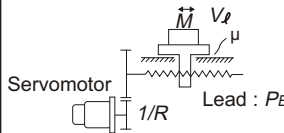
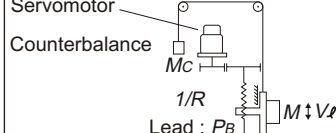
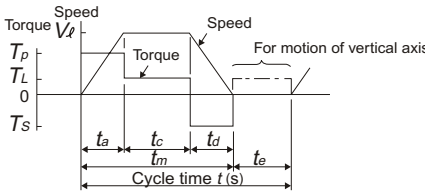
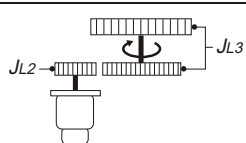
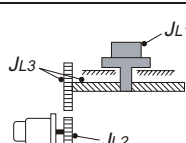
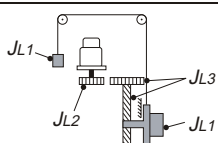
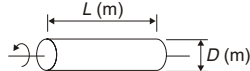
Servo Selection Software

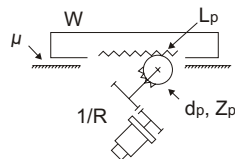
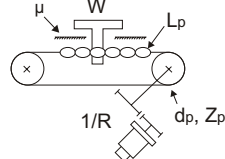
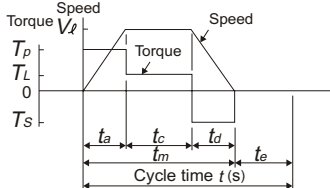
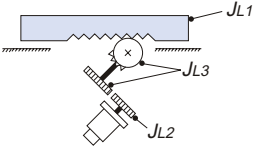
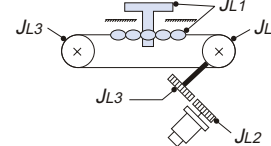
SigmaJunma Size+ Servo Drive sizing software

- Very Simple to use
- Driving method are shown in comprehensible figures
- Sizing tool models various parameters such as the mechanism, friction, external forces, etc. in the calculation process
- Inertia is automatically calculated
- Velocity diagram can be set
- Sizing information is saved and it is reusable



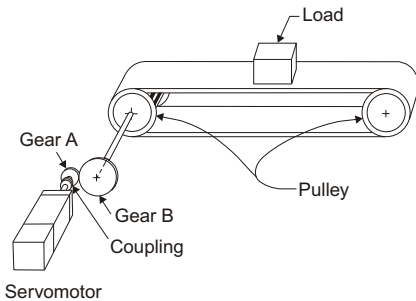
Formulae for selecting Servomotor capacity

Motions	Rotational Motion	Linear Motion	
		Horizontal Axis	Vertical Axis
Mechanical Configuration			
	N : Load axis speed (min ⁻¹) V : Load speed (m/min) T : Effective load torque at motor shaft (N·m) μ : Friction coefficient	P_B : Ball screw lead (m) M : Mass of linear-motion unit (kg) M_C : Mass of counterbalance (kg)	$1/R$: Gear ratio η : Combined efficiency T_M : Servomotor maximum torque (N·m)
Speed Diagram			
Travel Distance (m)	$R = \frac{V_L}{60} \cdot \frac{t_a + 2t_c + t_d}{2}$ (Where $t_a = t_d$, $R = \frac{V_L}{60} (t_m - t_a)$)		
Load axis speed (min ⁻¹)	N_L	$N_L = \frac{V_L}{P_B}$	$N_L = \frac{V_L}{P_B}$
Motor Speed (min ⁻¹)	$N_M = N_L \cdot R$		
Effective Load Torque at Motor Shaft (N·m)	$T_L = \frac{T_L}{R \cdot \eta}$	$T_L = \frac{9.8 \times \mu \cdot M \cdot P_B}{2\pi \cdot R \cdot \eta}$	$T_L = \frac{9.8 \times (M - M_C) P_B}{2\pi \cdot R \cdot \eta}$
Effective Load Inertia at Motor Shaft (kg·m ²)	$J_L = J_{L1} + J_{L2} + J_{L3}$		
			
	Linear Motion	—	$J_{L1} = M \cdot \left(\frac{P_B}{2\pi R} \right)^2$
Rotational Motion	<div>• Solid cylinder </div> <div>$J_K = \frac{1}{8} M_K \cdot D^2$ or $J_K = \frac{\pi}{32} \rho \cdot L \cdot D^4$ M_K: Mass (kg) ρ: Density (kg/m³) (Iron $\rho = 7.87 \times 10^3$ (kg/m³) Aluminum $\rho = 2.70 \times 10^3$ (kg/m³)</div> <div><Inertia for motor shaft> At gear input side $J_{L2} = J_K$ At gear output side $J_{L3} = \frac{J_K}{R^2}$</div>		
Running Power (W)	$P_0 = \frac{2\pi \cdot N_M \cdot T_L}{60}$		
Acceleration Power(W)	$P_a = \left(\frac{2\pi}{60} \cdot N_M \right)^2 \frac{J_L}{t_a}$		
Required Starting Torque (N·m)	$T_P = \frac{2\pi \cdot N_M (J_M + J_L)}{60 \times t_a} + T_L$		
Required Braking Torque (N·m)	$T_S = \frac{2\pi \cdot N_M (J_M + J_L)}{60 \times t_d} - T_L$		
Effective Torque (N·m)	$T_{rms} = \sqrt{\frac{T_P^2 \cdot t_a + T_L^2 \cdot t_c + T_S^2 \cdot t_d}{t}}$	$T_{rms} = \sqrt{\frac{T_P^2 \cdot t_a + T_L^2 (t_c + t_e) + T_S^2 \cdot t_d}{t}}$	
Min. Starting Time (S)	$t_{am} = \frac{2\pi \cdot N_M (J_M + J_L)}{60 (T_M - T_L)}$		
Min. Braking Time (S)	$t_{dm} = \frac{2\pi \cdot N_M (J_M + J_L)}{60 (T_M + T_L)}$		

Motions	Linear Motion	
	Rack & Pinion	Chain and Timin Belt
Mechanical Configuration		
	N_l : Load axis speed (min ⁻¹) V_l : Load speed (m/min) T_L : Effective load torque at motor shaft (N·m) μ : Friction coefficient	M : Mass of linear-motion unit (kg) $1/R$: Gear ratio η : Combined efficiency T_M : Servomotor maximum torque (N·m)
Speed Diagram		
Travel Distance (m)	$R = \frac{V_l}{60} \cdot \frac{t_a + 2t_c + t_d}{2} \quad \left(\text{Where } t_a = t_d, R = \frac{V_l}{60} (t_m - t_a) \right)$	
Load axis speed (min ⁻¹)	$N_l = \frac{V_l}{P_B}$	
Motor Speed (min ⁻¹)	$N_M = N_l \cdot R$	
Effective Load Torque at Motor Shaft (N·m)	$T_L = \frac{9.8 \times \mu \cdot M \cdot P_B + 2\pi \cdot T_l}{2\pi \cdot R \cdot \eta}$	
Effective Load Inertia at Motor Shaft (kg·m ²)	$J_L = J_{L1} + J_{L2} + J_{L3}$	
		
	$J_{L1} = M \cdot \left(\frac{P_B}{2\pi R} \right)^2$	
Linear Motion	$J_K = \frac{1}{8} M_K \cdot D^2 \quad \text{or} \quad J_K = \frac{\pi}{32} \rho \cdot L \cdot D^4$	
	M_K : Mass (kg) ρ : Density (kg/m ³) (Iron $\rho = 7.87 \times 10^3$ (kg/m ³) Aluminum $\rho = 2.70 \times 10^3$ (kg/m ³)	
Rotational Motion	<p><Inertia for motor shaft> At gear input side $J_{L2} = J_K$ At gear output side $J_{L3} = \frac{J_K}{R^2}$</p>	
Running Power (W)	$P_0 = \frac{2\pi \cdot N_M \cdot T_L}{60}$	
Acceleration Power(W)	$P_a = \left(\frac{2\pi}{60} \cdot N_M \right)^2 \frac{J_L}{t_a}$	
Required Starting Torque (N·m)	$T_P = \frac{2\pi \cdot N_M (J_M + J_L)}{60 \times t_a} + T_L$	
Required Braking Torque (N·m)	$T_S = \frac{2\pi \cdot N_M (J_M + J_L)}{60 \times t_d} - T_L$	
Effective Torque (N·m)	$T_{rms} = \sqrt{\frac{T_P^2 \cdot t_a + T_L^2 \cdot t_c + T_S^2 \cdot t_d}{t}}$	
Min. Starting Time (S)	$t_{am} = \frac{2\pi \cdot N_M (J_M + J_L)}{60 (T_M - T_L)}$	
Min. Braking Time (S)	$t_{dm} = \frac{2\pi \cdot N_M (J_M + J_L)}{60 (T_M + T_L)}$	

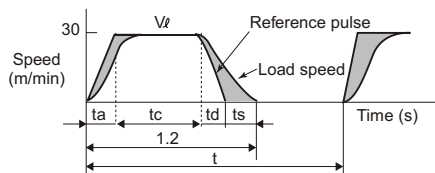
Servomotor selection example

Mechanical Specifications



- Load speed : $V_L = 30\text{m/min}$
- Mass of linear-motion unit: $M = 4\text{kg}$
- Pulley diameter : $D_P = 0.064\text{m}$
- Pulley thickness : $L_P = 0.02\text{m}$
- Coupling mass : $M_C = 2690\text{kg/m}^3$
- Coupling outer diameter : $D_C = 0.03\text{m}$
- Gear A outer diameter : $D_A = 0.02\text{m}$
- Gear A thickness : $L_A = 0.02\text{m}$
- Gear B outer diameter : $D_B = 0.1\text{m}$
- Gear B thickness : $L_B = 0.02\text{m}$
- Gear density : $\rho_A, \rho_B = 7870\text{kg/m}^3$
- Gear ratio : $R = 5$
- Positioning frequency : $n = 40\text{ times/min}$
- Traveling distance : $\ell = 0.5\text{m}$
- Positioning interval : $t_m = 1.2\text{ s max.}$
- Friction coefficient : $\mu = 0.2$
- Effective load torque : $T_L = 0.05\text{N}\cdot\text{m}$ at motor shaft
- Combined efficiency : $\eta = 0.9$ (90%)

Speed diagram



$$\text{Cycle time } t = \frac{60}{n} = \frac{60}{40} = 1.5 \text{ (s)}$$

Where acceleration time (t_a) = deceleration time (t_d) and setting time (t_c) = 0.1 s

$$\text{Acceleration time : } t_a = t_d = t_m - t_s - \frac{60 \times \ell}{V_L} = 1.2 - 0.1 - \frac{60 \times 0.5}{30} = 0.1 \text{ (s)}$$

$$\text{Constant-speed time : } t_c = t_m - t_s - t_a - t_d = 1.2 - 0.1 - 0.1 - 0.1 = 0.9 \text{ (s)}$$

Speed

$$P_B = \pi d = \pi \times 0.064 = 0.201$$

$$\text{• Load axis speed } N_L = \frac{V_L}{P_B} = \frac{30}{0.201} = 149 \text{ (min}^{-1}\text{)}$$

$$\text{• Motor speed } N_M = N_L \cdot R = 149 \times 5 = 745 \text{ (min}^{-1}\text{)}$$

Effective torque at motor shaft

$$T_L = \frac{\mu \cdot 9.8 \cdot M \cdot P_B + 2\pi \cdot T_L}{2\pi R \cdot \eta} = \frac{0.2 \times 9.8 \times 4 \times 0.201 + 2\pi \times 0.05}{2\pi \times 5 \times 0.9} = 0.0669 \text{ (N}\cdot\text{m)}$$

Effective load moment of inertia at motor shaft

$$J_L = J_{L1} + J_{L2} + J_{L3} = (1.639 + 0.687 + 0.362) \times 10^{-4} = 2.69 \times 10^{-4} \text{ (kg}\cdot\text{m}^2\text{)}$$

• Linear motion

$$J_{L1} = M \left(\frac{P_B}{2\pi R} \right)^2 = 4 \times \left(\frac{0.201}{2\pi \times 5} \right)^2 = 1.639 \times 10^{-4} \text{ (kg}\cdot\text{m}^2\text{)}$$

• Load-shaft motion: Pulley $\times 2$ + Gear B

$$J_{L2} = \frac{\rho J_i}{R^2} = \frac{1}{5^2} \times \frac{\pi}{32} \times (2690 \times 0.02 \times (0.064)^4 \times 2 + 7870 \times 0.02 \times (0.1)^4) = 0.687 \times 10^{-4} \text{ (kg}\cdot\text{m}^2\text{)}$$

• Motor-shaft motion: Gear A + Coupling

$$J_{L3} = \frac{\pi}{32} \times 7870 \times 0.02 \times (0.02)^4 + \frac{1}{8} \times 0.3 \times (0.03)^2 = 0.362 \times 10^{-4} \text{ (kg}\cdot\text{m}^2\text{)}$$

Load running power

$$P_o = \frac{2\pi N_M \cdot T_L}{60} = \frac{2\pi \times 745 \times 0.0669}{60} = 5.2(\text{W})$$

Load acceleration power

$$P_a = \left(\frac{2\pi}{60} N_M \right)^2 \frac{J_L}{t_a} = \left(\frac{2\pi}{60} \times 745 \right)^2 \times \frac{2.69 \times 10^{-4}}{0.1} = 16.4(\text{W})$$

Recommended Servomotor selections

- Conditions
- $T_L \leq$ Motor rated torque
 - $P_a + P_o = (1 \text{ to } 2) \times$ Motor rated output
 - $N_M \leq$ Motor rated speed or maximum speed
 - $J_L \leq$ Allowable load inertia of Servopack

From these conditions, the following selections are recommended :

- Servomotor : SJME-02AMA4
- Servopack : SJDE-02APA

<Ratings>

- Rated output : 200(W)
- Rated speed : 3000(min⁻¹)
- Maximum speed : 4500(min⁻¹)
- Rated torque : 0.637(N·m)
- Instantaneous peak torque : 1.91(N·m)
- Rotor moment of inertia : 0.417×10⁻⁴(kg·m²)
- Allowable load inertia of Servopack : 3×10⁻⁴(kg·m²)

Servomotor check

Required starting torque

$$T_P = \frac{2\pi N_M (J_M + J_L)}{60 t_a} + T_L = \frac{2\pi \times 745 \times (0.417 + 2.69) \times 10^{-4}}{60 \times 0.1} + 0.0669 = 0.309(\text{N·m})$$

<1.91(N·m) = Instantaneous peak torque
Therefore, the Servomotor can be used.

Required breaking torque

$$T_S = \frac{2\pi N_M (J_M + J_L)}{60 t_a} - T_L = \frac{2\pi \times 745 \times (0.417 + 2.69) \times 10^{-4}}{60 \times 0.1} - 0.0669 = 0.175(\text{N·m})$$

<1.91(N·m) = Instantaneous peak torque
Therefore, the Servomotor can be used

Effective torque

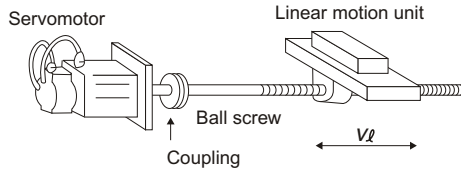
$$T_{rms} = \sqrt{\frac{T_P^2 \cdot t_a + T_L^2 \cdot t_c + T_S^2 \cdot t_d}{t}} = \sqrt{\frac{(0.297)^2 \times 0.1 + (0.0669)^2 \times 0.9 + (0.177)^2 \times 0.1}{1.5}}$$

= 0.1032(N·m)
< 0.637(N·m) = Rated torque
Therefore, the Servomotor can be used

Therefore the recommended selection of servomotors and Servopacks has sufficient capacity and can be used.

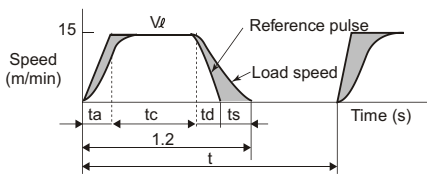
Servomotor selection example

Mechanical Specifications



- Load speed : $V\ell = 15\text{m/min}$
- Mass of linear motion unit: $M = 80\text{kg}$
- Ball screw length : $L_B = 0.8\text{m}$
- Ball screw diameter : $D_B = 0.016\text{m}$
- Ball screw lead : $P_B = 0.005\text{m}$
- Coupling mass : $Mc = 0.3\text{kg}$
- Coupling outer diameter: $DC = 0.03\text{m}$
- Positioning frequency : $n = 40\text{ times/min}$
- Traveling distance : $\ell = 0.25\text{m}$
- Positioning interval : $t_m = 1.2\text{ s max.}$
- Friction coefficient : $\mu = 0.2$
- Combined efficiency : $\eta = 0.9\text{ (90\%)}$

Speed diagram



$$\text{Cycle time } t = \frac{60}{n} = \frac{60}{40} = 1.5 \text{ (s)}$$

Where acceleration time (t_a) = deceleration time (t_d) and setting time (t_c) = 0.1

$$\text{Acceleration time : } t_a = t_d = t_m - t_s - \frac{60 \times \ell}{V\ell} = 1.2 - 0.1 - \frac{60 \times 0.5}{30} = 0.1 \text{ (s)}$$

$$\text{Constant-speed time : } t_c = t_m - t_s - t_a - t_d = 1.2 - 0.1 - 0.1 - 0.1 = 0.9 \text{ (s)}$$

Speed

- Load axis speed : $N\ell = \frac{V\ell}{P_B} = \frac{15}{0.005} = 3000 \text{ (min}^{-1}\text{)}$
- Motor speed : Because of direct coupling, the gear ratio is $1/R = 1/1$.
Then, $N_M = N\ell \cdot R = 3000 \times 1 = 3000 \text{ (min}^{-1}\text{)}$

Effective torque at motor shaft

$$T_L = \frac{\mu \cdot 9.8 \cdot M \cdot P_B}{2\pi R \cdot \eta} = \frac{0.2 \times 9.8 \times 80 \times 0.005}{2\pi \times 1 \times 0.9} = 0.139 \text{ (N}\cdot\text{m)}$$

Effective load moment of inertia at motor shaft

$$J_L = J_{L1} + J_B + J_C = 1.25 \times 10^{-4} \text{ (kg}\cdot\text{m}^2\text{)}$$

- Linear motion : $J_{L1} = M \left(\frac{P_B}{2\pi R} \right)^2 = 80 \times \left(\frac{0.005}{2\pi \times 1} \right)^2 = 0.507 \times 10^{-4} \text{ (kg}\cdot\text{m}^2\text{)}$
- Ball screw : $J_B = \frac{\pi}{32} \eta \cdot L_B \cdot D_B^4 = \frac{\pi}{32} \times 7.87 \times 10^3 \times 0.8 \times (0.016)^4 = 0.405 \times 10^{-4} \text{ (kg}\cdot\text{m}^2\text{)}$
- Coupling : $J_C = \frac{1}{8} M_C \cdot D_C^2 = \frac{1}{8} \times 0.3 \times (0.03)^2 = 0.338 \times 10^{-4} \text{ (kg}\cdot\text{m}^2\text{)}$

Load running power

$$P_o = \frac{2\pi N_M \cdot T_L}{60} = \frac{2\pi \times 3000 \times 0.139}{60} = 43.7 \text{ (W)}$$

Load running power

$$P_a = \left(\frac{2\pi}{60} N_M \right)^2 \frac{J_L}{t_a} = \left(\frac{2\pi}{60} \times 3000 \right)^2 \times \frac{1.25 \times 10^{-4}}{0.1} = 123.4(\text{W})$$

Recommended Servomotor selections

- Conditions
- $T_L \leq$ Motor rated torque
 - $P_a + P_o = (1 \text{ to } 2) \times$ Motor rated output
 - $N_M \leq$ Motor rated speed or maximum speed
 - $J_L \leq$ Allowable load inertia of Servopack

From these conditions, the following selections are recommended :

- Servomotor : SJME-02AMA4
- Servopack : SJDE-02APA

<Ratings>

- Rated output : 200(W)
- Rated speed : 3000(min⁻¹)
- Maximum speed : 4500(min⁻¹)
- Rated torque : 0.637(N·m)
- Instantaneous peak torque : 1.91(N·m)
- Rotor moment of inertia : $0.417 \times 10^{-4}(\text{kg} \cdot \text{m}^2)$
- Allowable load inertia of Servopack : $3 \times 10^{-4}(\text{kg} \cdot \text{m}^2)$

Servomotor check

Required starting torque

$$T_P = \frac{2\pi N_M (J_M + J_L)}{60 t_a} + T_L = \frac{2\pi \times 3000 \times (0.417 + 1.25) \times 10^{-4}}{60 \times 0.1} + 0.139 \doteq 0.662(\text{N} \cdot \text{m})$$

< 1.91(N·m)=Instantaneous peak torque
Therefore, the Servomotor can be used.

Required breaking torque

$$T_S = \frac{2\pi N_M (J_M + J_L)}{60 t_a} - T_L = \frac{2\pi \times 3000 \times (0.417 + 1.25) \times 10^{-4}}{60 \times 0.1} - 0.139 \doteq 0.384(\text{N} \cdot \text{m})$$

< 1.91(N·m)= Instantaneous peak torque
Therefore, the Servomotor can be used

Effective torque

$$T_{rms} = \sqrt{\frac{T_P^2 \cdot t_a + T_L^2 \cdot t_c + T_S^2 \cdot t_d}{t}} = \sqrt{\frac{(0.662)^2 \times 0.1 + (0.139)^2 \times 0.9 + (0.384)^2 \times 0.1}{1.5}}$$

$\doteq 0.225(\text{N} \cdot \text{m})$
< 0.637(N·m)= Rated torque
Therefore, the Servomotor can be used

Therefore the recommended selection of Servomotor s and Servopacks has sufficient capacity and can be used.

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Product improvement is a continuous process. For the latest information and special applications, please contact any of L&T's offices listed here.



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